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purely aquatic bird could or would ascend and cross the western Cordillera, and then ascend to an icy, solitary lake on the shoulder of one of the loftiest volcanoes in the eastern range, 2,500 miles from its native place. Forbes found *Cyclas Chilensis* (formerly considered peculiar to the most southern and coldest part of Chili at the level of the sea) abundant in fresh-water ponds in the Bolivian plateau near La Paz, 14,000 feet high. Do not these facts point to changes in the Andes on a grand scale, and at a rate which, measured by the time required for a change of species, must be termed rapid ?

Alca impennis Linn. Original of Audubon's figure. A notice of this specimen was published in the *American Naturalist*, 1869.

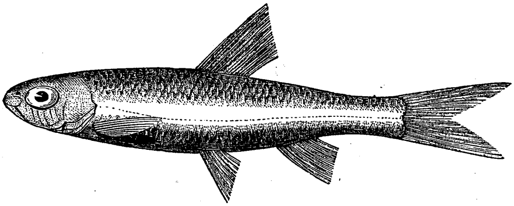
Mormon cirrhata Pall. Original of Audubon's figure.

Phaleris cristatella Pall. Original of Audubon's figure.

FURTHER NOTES ON NEW JERSEY FISHES.

BY CHARLES C. ABBOTT, M.D.

Fig. 163.



Hybognathus.

During the month of February of the present year (1870), Professor George H. Cook, State Geologist, sent to the author of this paper a number of "frost-fish," or "smelt" (*Osmerus mordax*), and among them was the single specimen figured above. On submitting this cyprinoid to Professor Cope of Philadelphia, he pronounced it undescribed, and has since described it* as *Hybognathus osmerinus.*

During the past summer the author had no opportunity of fishing in the Raritan River, at or about New Brunswick, at which point the specimen was taken; but among a number of small collections from that river, no specimen of this cyprinoid occurred. From other streams, generally not in the basin of the Raritan, isolated specimens have occurred, and the distribution seems to be without reference to salt water, although the type, and two other specimens, were taken from streams having direct access to the sea.

Of its habits, as yet, we have determined nothing; only learning from the specimens we have seen, that it seems to be very scarce, and associated by twos and threes with other cyprinoids, more especially with *Hybopsis Hudsonius*, which is very abundant in many of our smaller streams, as well as the Delaware River.

During the month of August of this year, the writer found a locality for two species which are not abundant elsewhere, so far as his own observations go to show. These fish are an etheostomoid (*Hololepis erochrous* Cope), and a "cat-fish" (*Noturus gyrinus*). They were both found abundantly in Stony Brook, Mercer Co., N. J., near the village of Princeton. The stream here is shallow, with a muddy bottom, and here and there a flat stone or two, under which both species took refuge when disturbed. On approaching the brook, the fish were found to be lying on the mud, near the edge of the stream, in water scarcely two inches deep. The movements of the etheostomoids were very deliberate, as they usually moved very slowly, making straight lines on the mud, apparently by not lifting themselves from the bottom of the stream. By placing a small baited hook immediately in front of the "darters," they would seize it with all the rapidity and voraciousness of a pike, and upon swallowing it, would invariably be taken. The writer took nearly fifty specimens with a hook, in about two hours. The "stone-cat-fish" were much more active, and shy; and would not take the hook, until after an immense deal of nibbling trying to the patience.

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* A Partial Synopsis of the Fishes of the Fresh Waters of North Carolina. By Edward D. Cope, A.M. Amer. Phil. Soc., Phila., 1870, p. 466; *foot note.*

While collecting specimens in Stony Brook, as mentioned above, the writer met with a nearly exhausted eel, into the left gills of which, a lamprey (*Petromyzon nigricans*), had inserted its sucking apparatus. The eel had drawn the lamprey by the suction power of the gill, into its throat, and having thus killed the lamprey, was itself nearly dead from endeavors to get rid of so great an incumbrance. In the stomachs of both the eel and the lamprey, were found masses of partially broken shells of minute *Lymneæ*, showing (circumstantial evidence) that they had been occupied in feeding upon the same food on the same ground, when the lamprey made his unfortunate attack upon the eel. Has it been noticed before, that the lamprey feeds upon small shells?

Two specimens of *Aphrodederus Sayanus*, were taken in Stony Brook, during the summer, and have been since kept alive in an aquarium. Soon after their capture, and since, one of them has exhibited the following "freak of coloration." The specimens, while lying on the pebbles at the bottom of the tank, were each of a glossy black, relieved by a pale brown throat, well dotted with black; and with a snowy white margin to the caudal fin. They were removed by a small net, to another tank having somewhat colder water in it, and immediately one of the pair became of a uniform pale straw color, except the black dots on the throat, and a narrow line running from the lower edge of the orbit to the jaw. The white margin of the caudal fin was scarcely distinguishable from the general color of the fin and body. The iris became silvery, with a mere trace of yellow. In the course of half an hour, the tints commenced to grow deeper, and full two hours elapsed before the usual black hue was resumed and the two specimens became similar in appearance.

Had this specimen thus "bleached" on being removed from one tank to another, done so on being taken wholly from the water, and, thus faded, had been preserved in alcohol, might it not have been looked upon as an *Aphrodederus albidus* nov. spec., and thus additional synonomy been offered to the confusion now existing? Is it, in fact, safe to consider color as of *any value* as a specific character, unless by comparing many specimens, and finding the variation uniform and without gradations? We have found the "sun-fish" as a group, to vary very much in accordance with the character of the stream in which they were found; and in an aquarium the "banded sunfish" (*Mesogonistius chœtodon* Gill), is verily kaleidoscopic. The black bands actually sometimes *wholly* disappear!

THE SPORES OF LICHENS.

BY H. WILLEY.

THE importance of the spores in the study of lichens, will perhaps render interesting a more extended reference to this branch of lichen history. The spores were known to Micheli, who figures those of several species in his "Nova Genera Plantarum," 1729, as did also Acharius in his "Lichenographia Universalis," 1810. But he made no use of them in his system. The great work of Fries, "Lichenographia Europæa Reformata," 1831, has no reference to the spores, excepting a few remarks in regard to their germination; but Eschweiler in the same year, made a somewhat careful examination of them, and noticed their various forms, although he endeavored in vain, he says, to make use of the spore-case in distinguishing genera. Fée, in the supplement to his "Essai," 1837, was the first to do this, and to figure and describe accurately the spore-cases and spores. But